Preface

The IUPAC Symposium on the "Physical Chemistry of Colloids and Macromolecules" (the Svedberg Symposium) was held on August 22–24, 1984, at Uppsala University, Sweden, to celebrate the 100th anniversary of the birth of Professor Theodor Svedberg, born on August 30, 1884. The Symposium was attended by 220 scientists, of whom 100 were from abroad, representing 17 countries. In addition, 40 Swedish senior high school students (20 boys and 20 girls) attended by invitation on special fellowships. These students were selected by their teachers to be the best chemistry student of his/her high school. Most of the students had previously been Berzelius Fellows at the annual Berzelius Days for high school students, arranged by the Swedish Chemical Society.

The Symposium programme offered a total of 49 presentations, of which 10 were introductions and other short addresses, 6 were retrospective lectures on Svedberg's contributions to science, 6 were lectures on colloid and surface science, 7 on sedimentation analysis of proteins and polysaccharides, and 20 on macromolecular solutions and gels. These areas of research, together with isotope and radiation studies, represent the main fields of activity of Svedberg and his students and associates.

The Symposium Volume contains the main addresses and the invited lectures. The retrospective lectures describe the intense and successful work of a great scientist in a wide area. We can follow how Svedberg's main interest in research gradually shifted from inorganic colloids to proteins and other macromolecules, and during the last period, after his retirement as professor of physical chemistry at 65, mainly to nuclear and radiation research. Svedberg's extensive activity in research formed the basis for three new departments of Uppsala University: Physical Chemistry, Biochemistry, and Nuclear Chemistry.

The main lectures invited describe current research in the "Svedberg areas". They reflect the importance of Svedberg's pioneering research on colloids and macromolecules. The development of ultracentrifugal sedimentation, and other preparative and analytical methods for protein research which followed, has made Uppsala a leading research centre in the field of protein analysis.

Polymer research started in the 1920's when the concept "macromolecules" was proposed and after a decade of studies and discussions generally accepted. In his introductory lecture, "Polymers in the 1920's", Professor Herman F. Mark gave an eyewitness report of this dramatic period of polymer science. Svedberg's decisive contribution to support of the macromolecular concept, as pointed out by Herman Mark, was in his measurements of molecular weight (mass), using the ultracentrifuge which he constructed in 1923 to 1926.

Svedberg's broad interests in research covered a wide field in physics, chemistry, biology and technology - and a life-long devotion to botany - as described by his close associate through several decades, Professor Sven Brohult, in his general lecture on "Svedberg as a Scientist".

The retrospective lectures on Svedberg's contributions to research present his early studies on colloid chemistry (P. Stenius), his pioneering and extensive protein research (K.O. Pedersen) and his studies on polysaccharides (I. Jullander) and synthetic polymers (P.O. Kinell). A personal account of the development of "The First Svedberg Centrifuges" in 1923–26 is given by one of Svedberg's students at this time, Dr. J.B. Nichols, who participated in this work both at the University of Wisconsin and at Uppsala University. One of the retrospective lectures, "Contributions of Svedberg to Nuclear and Radiation Research" (B. Larsson and S. Kullander) reviews Svedberg's life-long interest in this field, which resulted in the formation of the Gustaf Werner Institute as a department of Uppsala University.

The invited lectures on colloid and surface science, included in the Symposium Volume, are reviews of three active areas of research: surface-enhanced Raman scattering, which gives the intense colour of many colloids (M. Kerker), the colloidal behaviour of surfactant systems (B. Lindman and H. Wennerström), and the use of colloidal silica particles for centrifugal separation of biological materials (H. Pertoff and T.C. Laurent).

Ultracentrifugal sedimentation, pioneered by Svedberg for molecular weight (mass) measurements, is now a sophisticated technique supported by advanced theory (L.O. Sundelöf) and developed as a source of more general information on macromolecules in solution (A.J. Staverman), especially for proteins in aqueous solution (H. Suzuki). Recent advances in thermal diffusion and sedimentation, another field of Svedberg's research interests, is also presented in the Symposium Volume (F.J. Bonner).

Macromolecular solutions and gels are extensively studied, e.g. by light scattering for molecular weight (mass) measurements (H. Benoit, M. Bennmouna, C. Strazielle and C. Cesteros), and by Carbon-13 NMR for studies of association and phase structure in polymer gels (B. Lindstedt and P. Flodin). Remarkable success in analysis of proteins in solution is achieved by high performance electrophoresis (S. Hjertén and M. Zhu) and group-specific adsorbents (J. Forath, M. Belew, F. Maisano and B. Olin) as reported in the Symposium Volume.
Svedberg was a man of many interests and talents. As an introduction to an exhibition "The Svedberg - Scientist, Writer, Artist", opened on August 22 at the University Library "Carolina Rediviva", three short lectures were given: "Svedberg as an Author" by N. Gralén, "Svedberg as a Botanist" by C.-J. Clendeson, and "Svedberg as an Artist" by P. Ahlström. They are included in the Symposium Volume to give perspectives on Svedberg's remarkable achievements in many fields of human endeavour. This is further illustrated in the after-dinner speech on "Svedberg as a Promotor of Science and Technology" by N. Gralén, given at the Symposium Banquet at Uppsala Castle on August 23.

In the final chapter of the Symposium Volume, Svedberg speaks for himself on science, technology, society, and the human mind. It is in a lecture on "The Aims and the Means of Research" given by Svedberg on September 10, 1947, at the inauguration of an industrial research laboratory. This lecture presents Svedberg's extensive knowledge of science and technology and his confidence in and enthusiasm for science as the basis for human progress. But he also expresses his deep concern and responsibility for the misuse of science applications. The threat of nuclear devastation and the end of our civilization was clear to Svedberg in 1947.

The social programme of the Symposium programme offered a reception with a buffet supper on Tuesday, August 21, by invitation of Pharmacia AB, Uppsala, Sweden; a reception with supper courtesy of Uppsala Municipality and a concert featuring Swedish music by the Royal Academic Orchestra (Conductor, Director Musices, Dr. Carl Rune Larsson) in the University Main Building on Wednesday, August 22; a reception in the University Main Building to show the art and other treasures of Uppsala University by invitation of the President, "Rector Magnificus", Professor Martin Hison Holmdahl; and a buffet banquet in Uppsala Castle by invitation of LKB-Produkter AB, Bromma, Sweden, on Thursday, August 23. On Saturday, August 25, a sightseeing and excursion tour was made in Uppsala and its surroundings to the Cathedral, the old University Building ("Gustavianum"), the Bror Hjort Museum, to Old Uppsala with the Viking King's Mounds and to Hammarby, the summer residence of the Swedish botanist Carl von Linné (Linnaeus), Professor at Uppsala University in "Medicine and Natural History" 1741-78.

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As editor of the Symposium Volume, I would like to thank the authors for their contributions. The editing of the manuscripts has been done with a light hand and some repetitions seem inevitable. Svedberg's work is seen from various angles by different coworkers and other scientists. The Symposium Volume is an account of Svedberg's contributions and his importance in science. At present Professor Tore Frängsmyr, Uppsala University, is working on a biography of Svedberg. Svedberg's personal recollections "Fragment" (356 pages) are deposited in the University Library of Uppsala University "Carolina Rediviva" and have been made available to me by Mrs Margit Svedberg, which I gratefully acknowledge. Svedberg was modest, both as a person and about his own research. When he was awarded the Nobel Prize for Chemistry in 1926, he stated - as pointed out by Professor Martin H:son Holmdahl in his welcoming address to the Symposium - that the prize had been given too early. So far as is known, Svedberg is the only Nobel-Prize winner who has had this opinion. Our thanks are due to Professor Holmdahl for being an excellent host at Uppsala University and for contributing to the biography of The Svedberg.

Most of the manuscripts have been linguistically corrected by University Lecturer Donald MacQueen, Uppsala University, for which I am grateful.

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Editor